SCADA systems

Introduction

- **SCADA :**

  "Supervisory Control And Data Acquisition"

- A type of ***Industrial Control System*** (ICS) that is used to monitor & remotely control critical industrial processes.

Why the emphasis on SCADA ?

- SCADA supports Critical Infrastructures of a nation e.g.
  - ✓ Electrical Power Grids
  - ✓ Oil & Gas pipelines
  - ✓ Refineries and chemical plants
  - ✓ Water and wastewater systems
  - ✓ Manufacturing operations

SCADA components

1. Field Instrumentation

   e.g. CT, PT, RTU, PLC

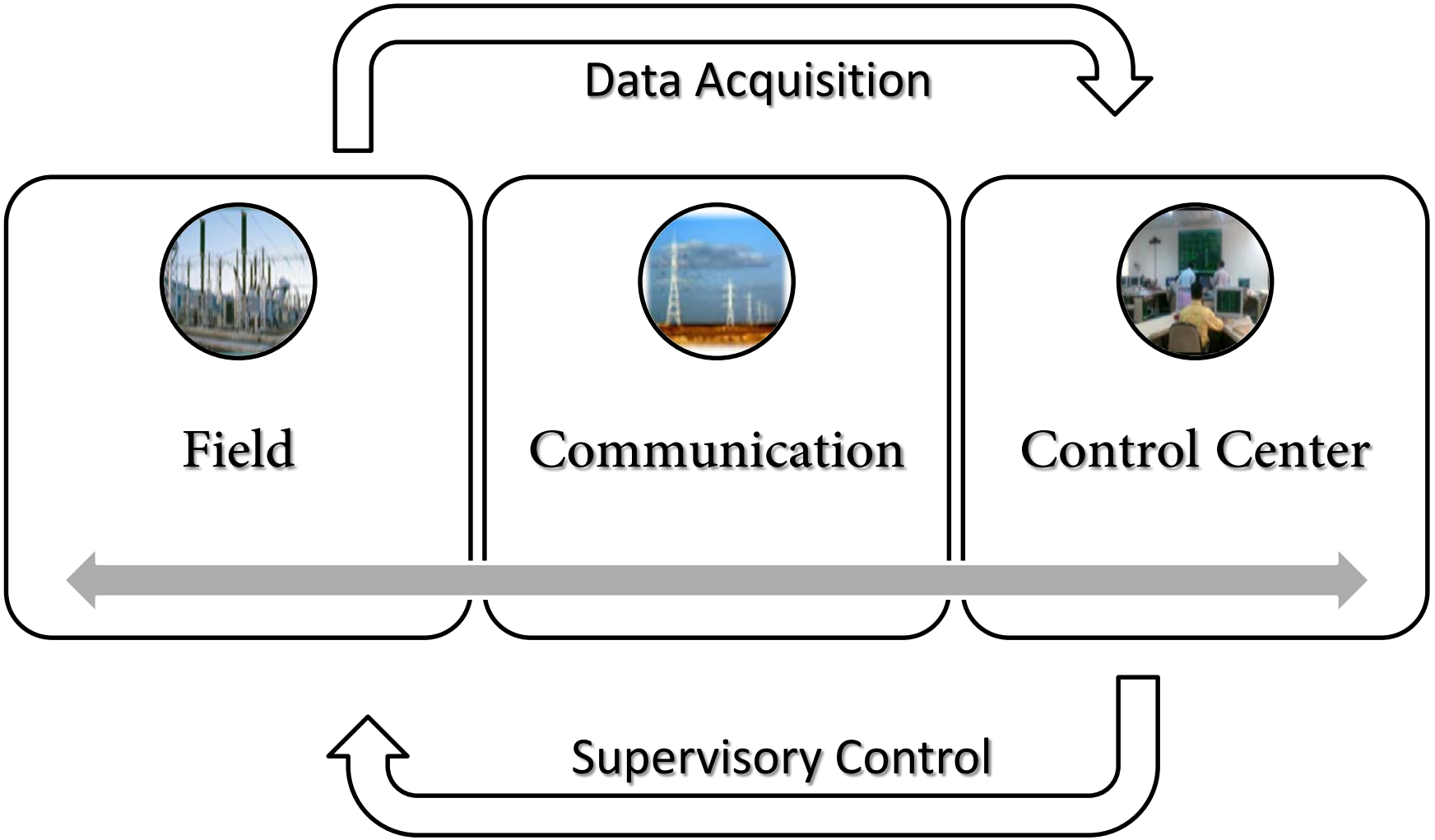
2. Communication Network

   e.g. Cable, PLCC, Wideband, GPRS

3. Control Center

   e.g. SLDC, Master SCADA

SCADA components



SCADA components

[1].Field Instrumentation:

- Collects all info of the system & transport to the control center.
- Installed @ Field Station
- Collects info by CTs, PTs, Transducer, RTUs(Remote Terminal Unit), IEDs(Intelligent Electronic Devices)

SCADA components

[1].Field Instrumentation:

Types of info associated in a power system -

Digital Information

- Breaker Status
- Isolator Status

Analog Information

- Voltage
- Current
- Frequency
- Power Factor

SCADA components

[2]. Communication Network:

- Dedicated Telephone Lines
- PLCC (Power Line Carrier Communication)
- VHF (Very High Frequency)
- Microwave
- GPRS (General Pocket Radio Service)
- Optical Fibre

SCADA components

[3]. Control Centre:

- Front End System- Interface between RTU & master SCADA
- Data Base
- HMI (Human-Machine Interface)
- LAN
- Peripheral

SCADA components

[3]. Control Centre:

Control Strategy : Key Priorities

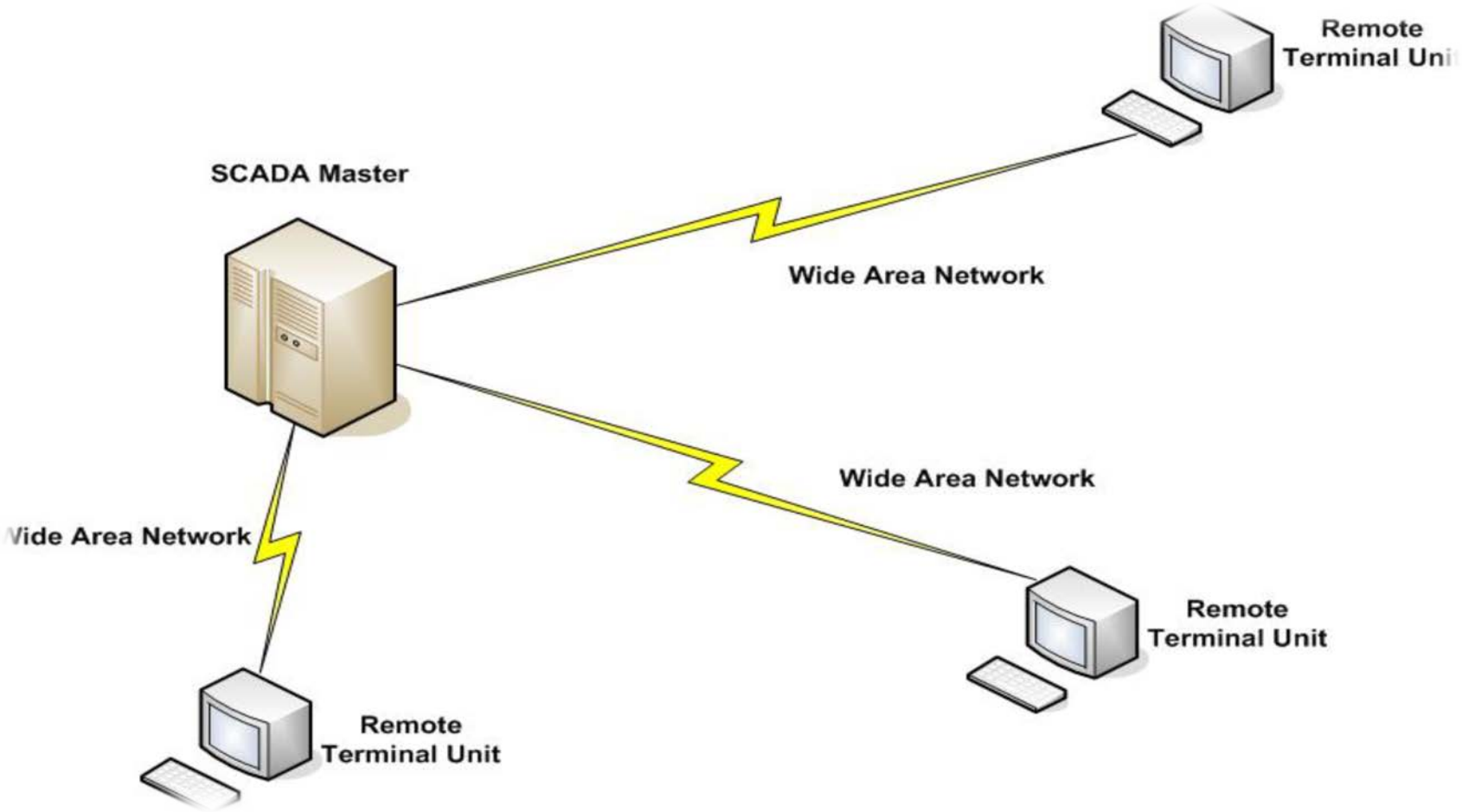
- Balance generation & demand (dispatching)
- Monitor flows and observe system limits
- Coordinate maintenance activities
- Protect equipment from damage

SCADA architecture

- First Generation – Monolithic
- Second Generation – Distributed
- Third Generation – Networked

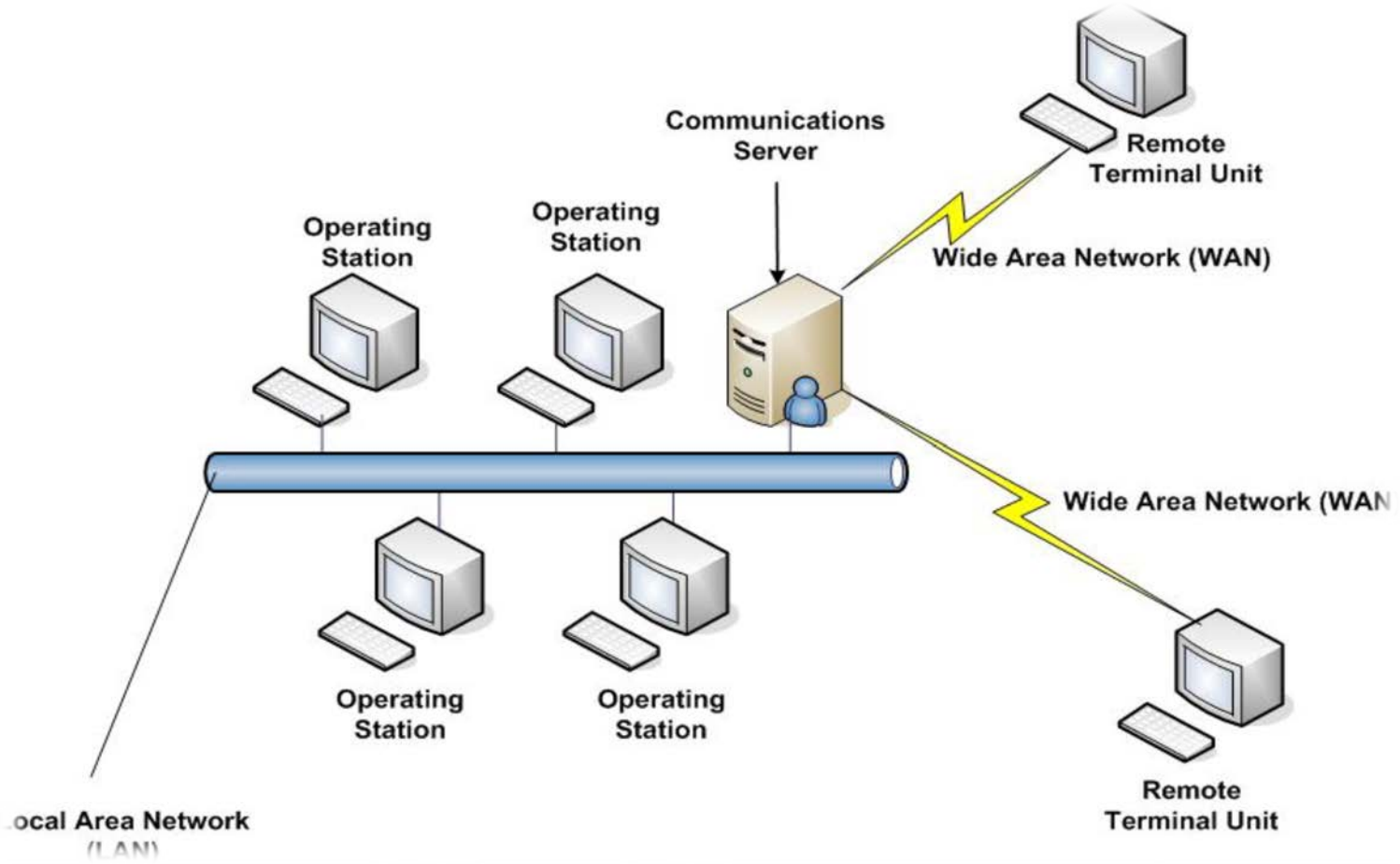
SCADA architecture

First Generation – Monolithic



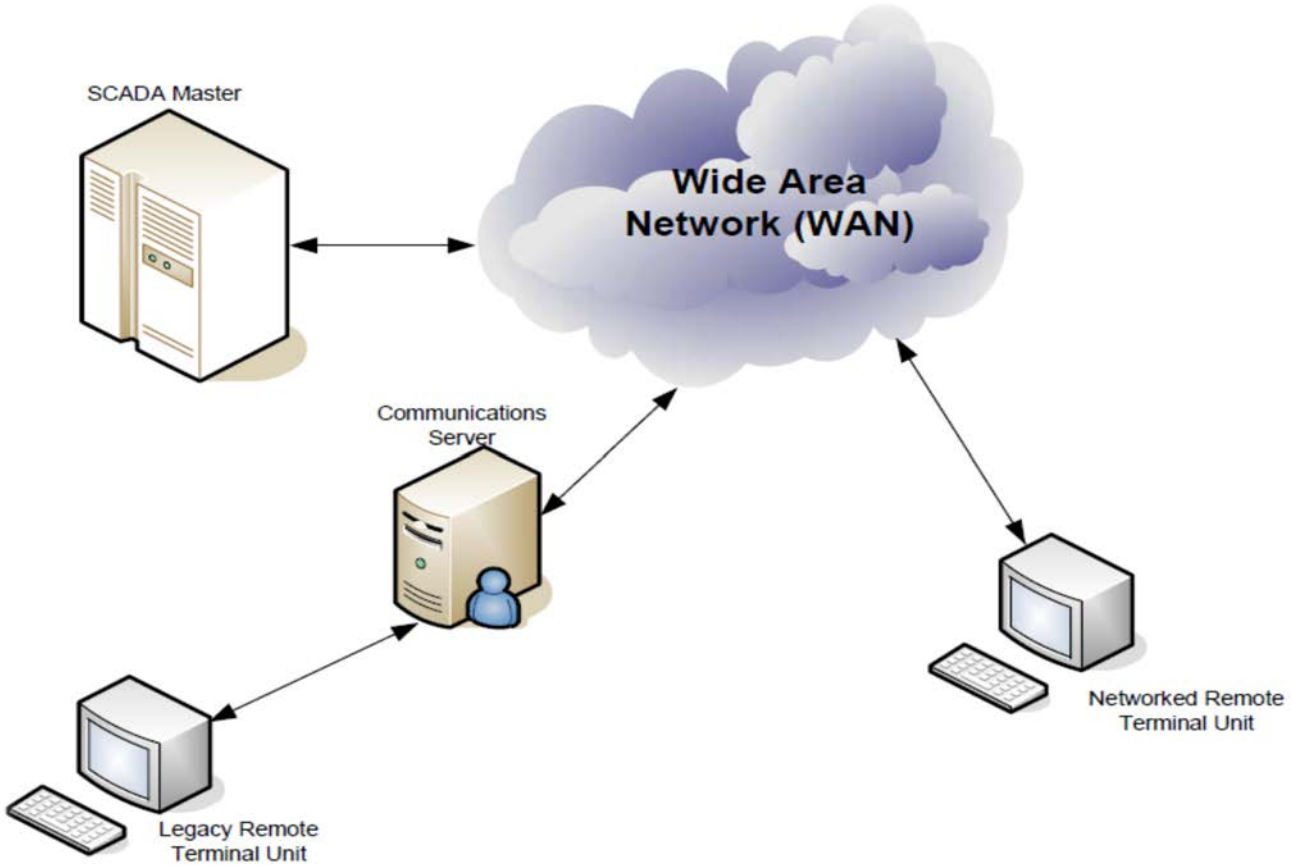
SCADA architecture

Second Generation – Distributed



SCADA architecture

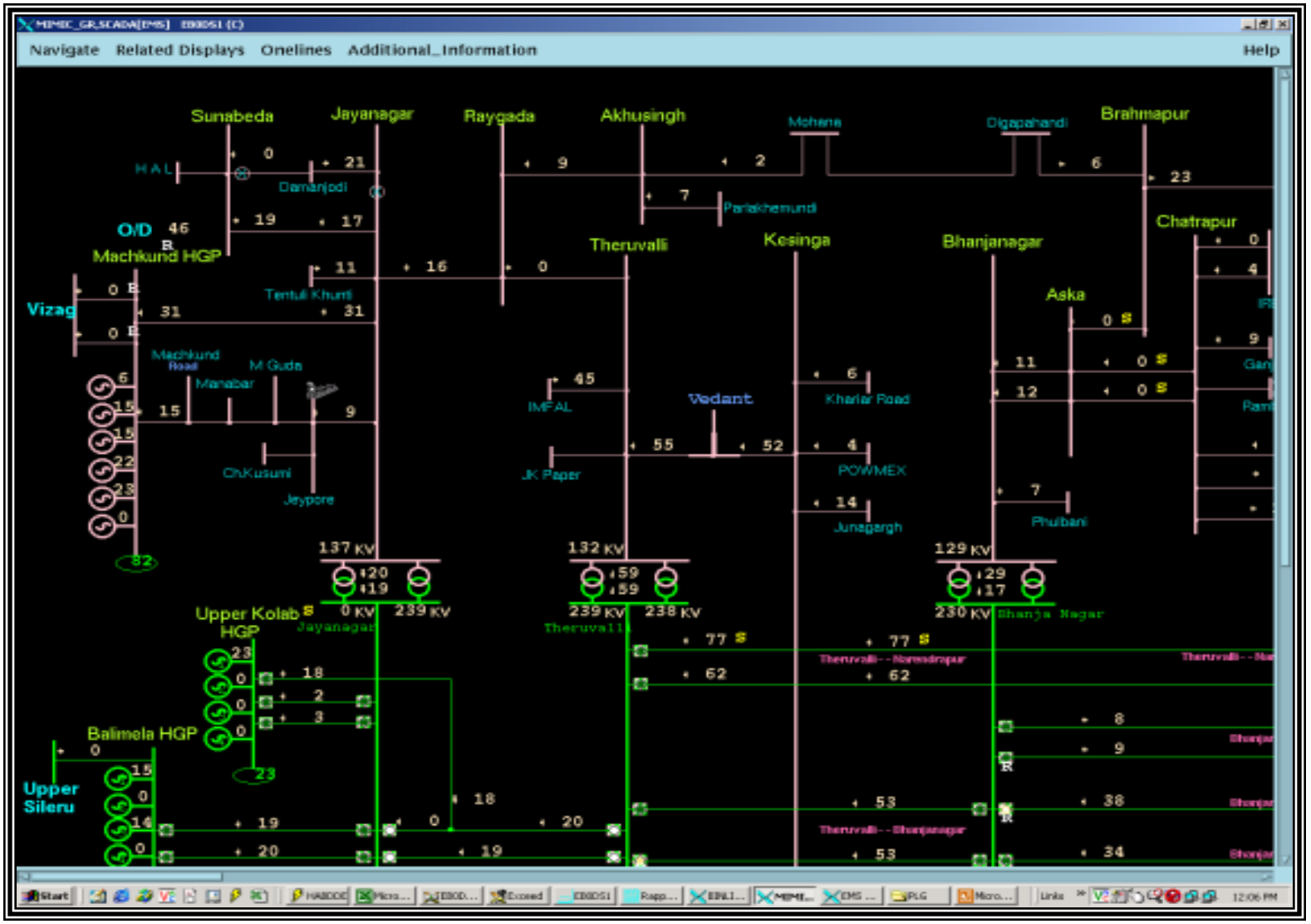
Third Generation – Networked



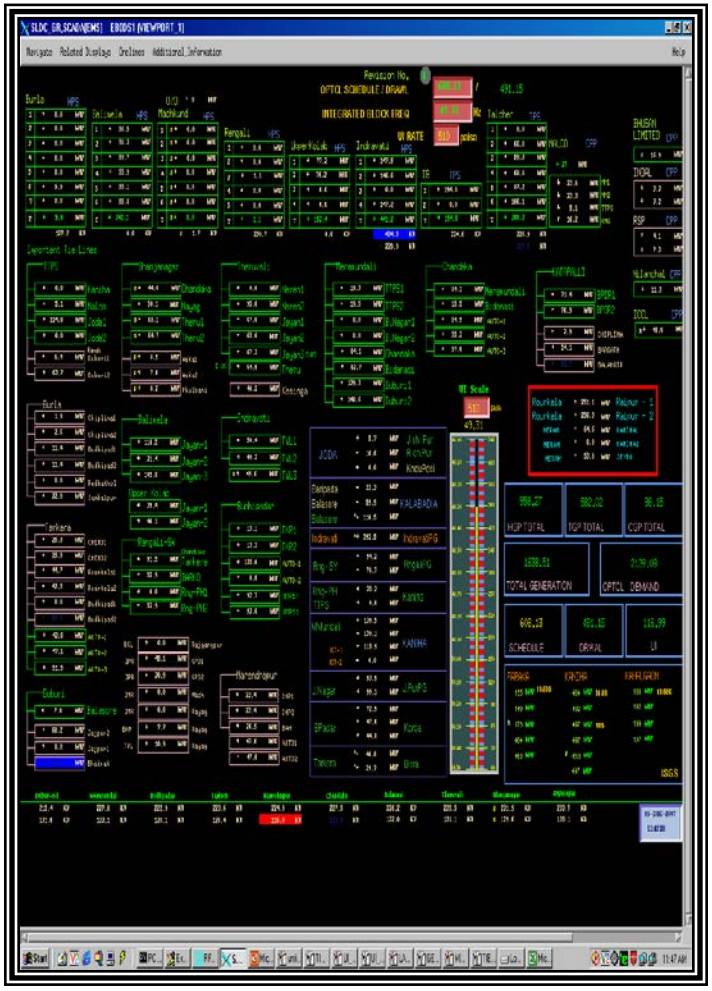
Functions of SCADA system

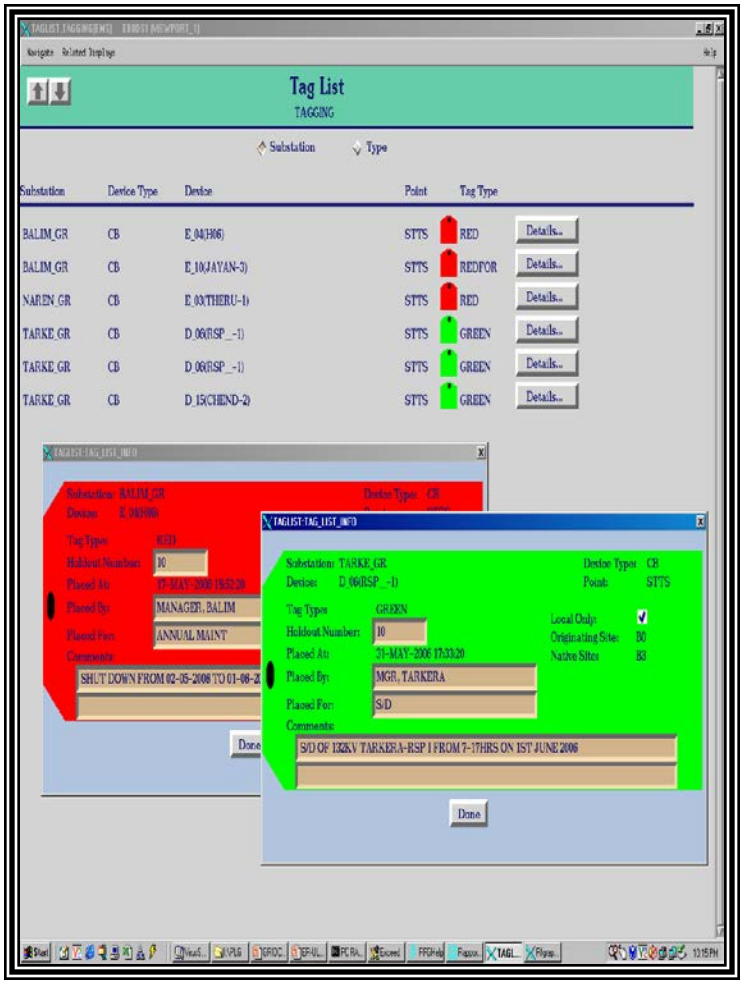
- Information Display
- Supervisory Control
- Alarm Processing & Tagging
- Information Storage & Reports
- Data Calculation
- Special RTU Processing Control

Information Display

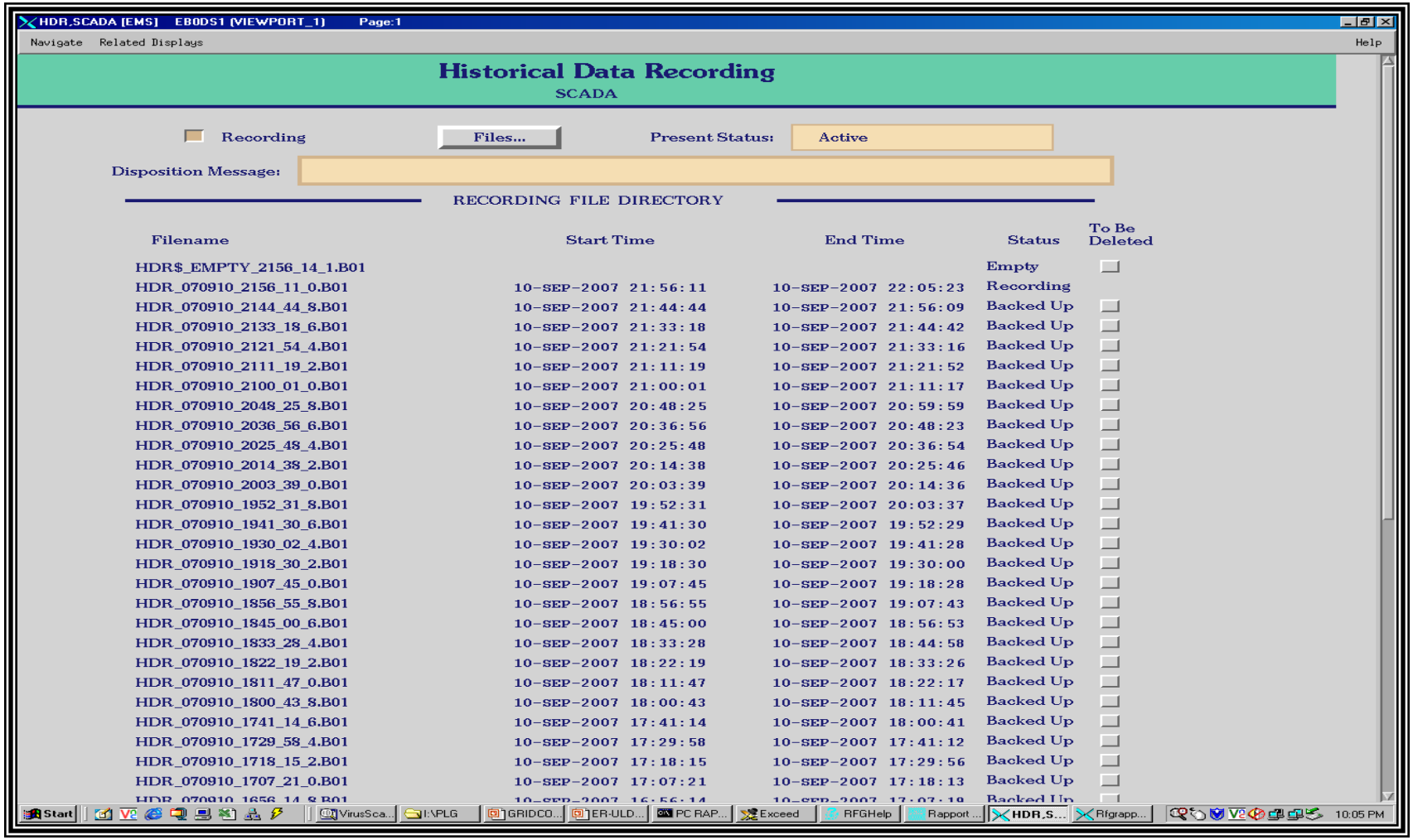


Alarm Processing & Tagging





Information Storage & Reports



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HDR_070910_2144_44_8.B01	10-SEP-2007 21:44:44	10-SEP-2007 21:56:09	Backed Up	
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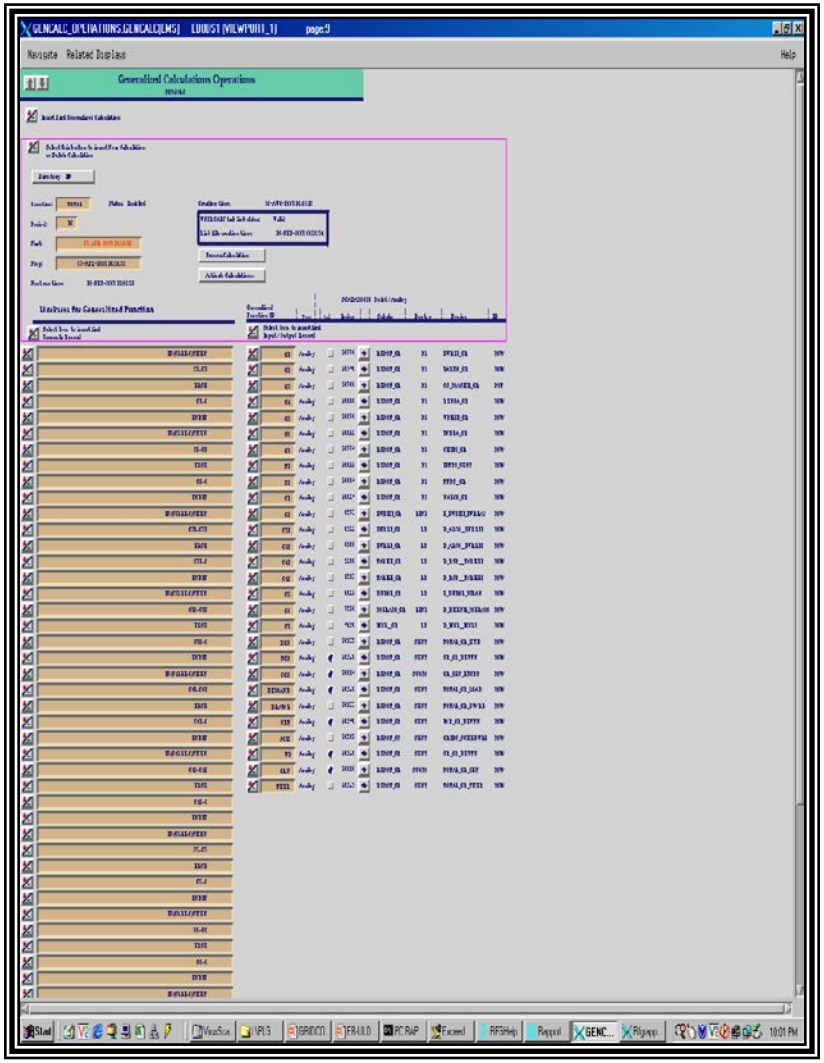
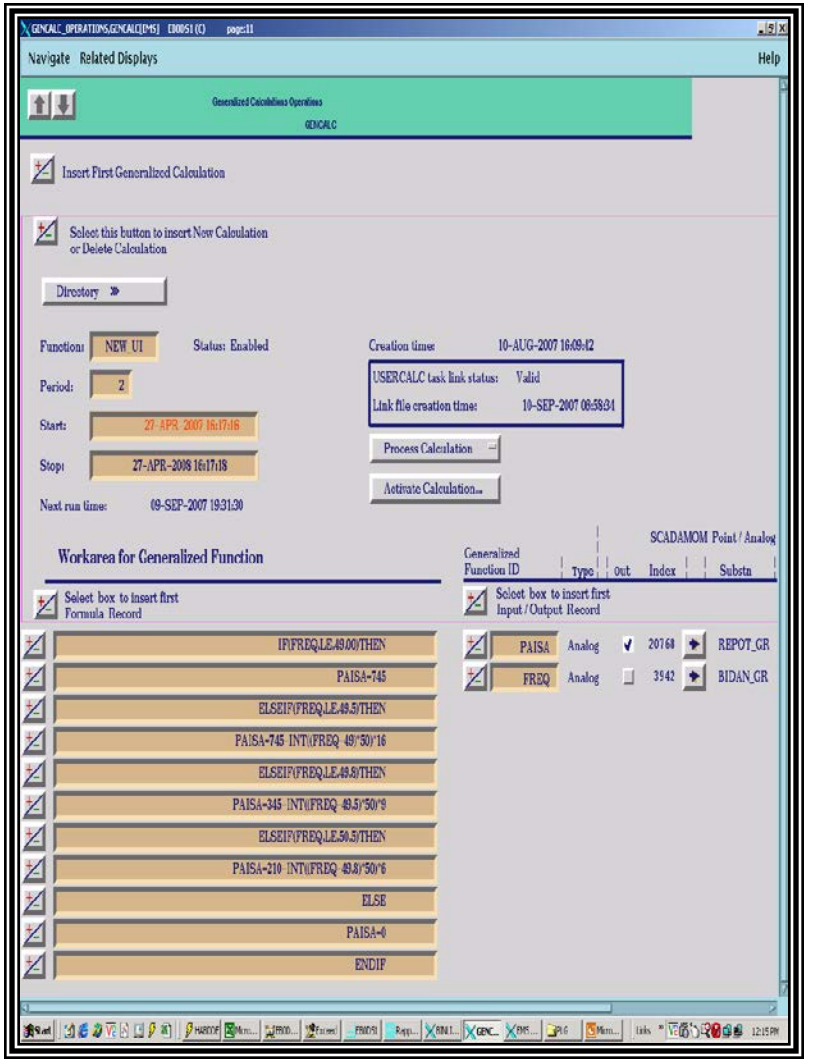
Data Calculation





Problems with SCADA

- No authentication (Unencrypted Communication)
- No security patching
- Multiple access points
- Complex System
- Dependent on industries driven by profit, not security

Mitigation Strategy

- Security through obscurity

  - Poor defence against “structured adversary”

- Isolated network

  -Unrealistic given today’s business demands

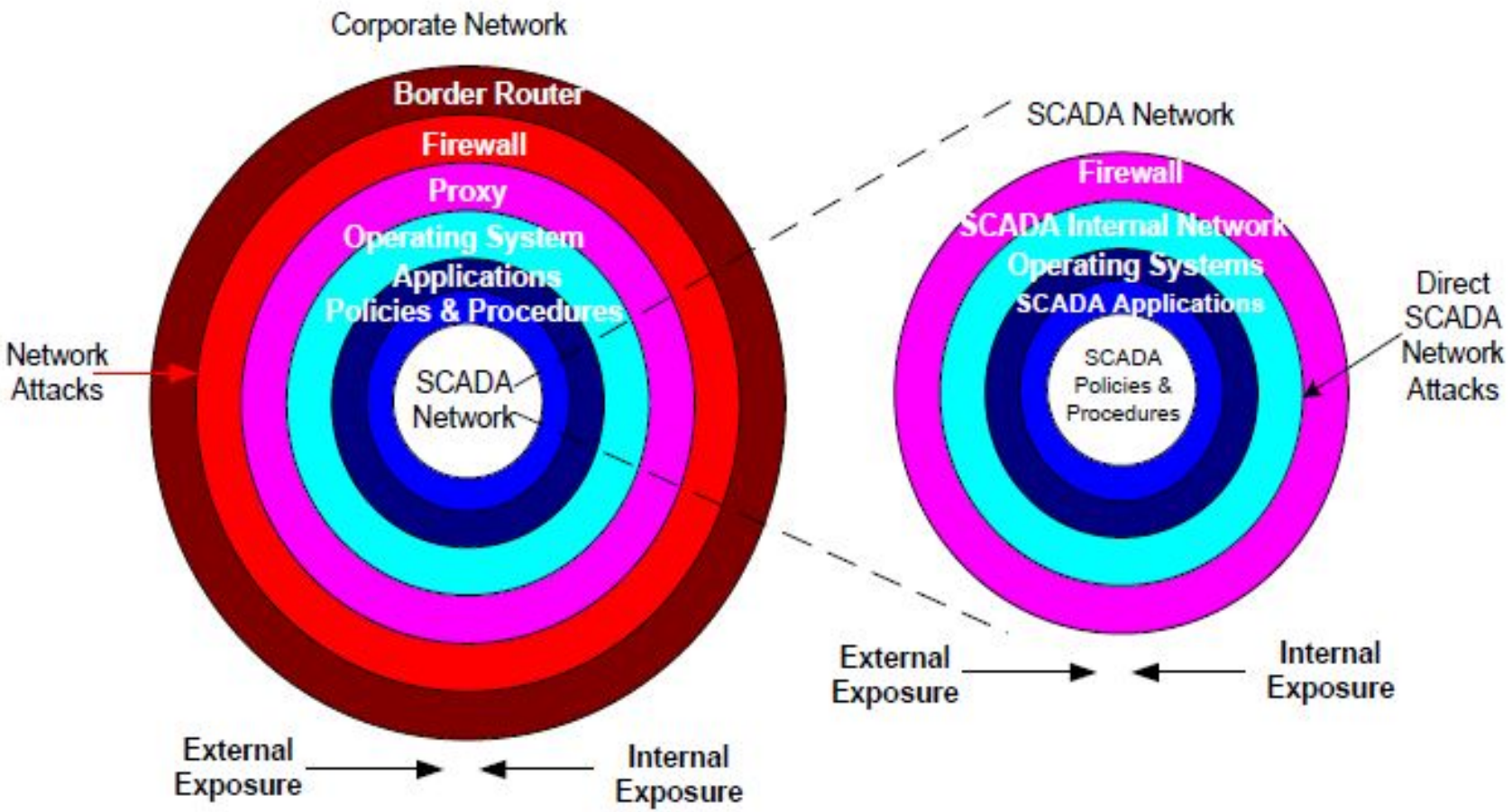
- Communication encryption

  - Concerns over latency, reliability

- Signal authentication

  - May provide good defence without the concerns associated with full signal encryption

Ring of Defenses



Steps for Enhancing SCADA security

- Establish a robust network architecture.
- Eliminate untrusted remote access points of entry.
- Evaluate and deploy technology and approaches to enhance confidentiality, availability, and integrity.
- Provide adequate support and training
- Never become complacent !! ☺

Last Words…

SCADA systems are becoming more & more interconnected and more accessible to the same villains who attacks our IT networks. But the difference is comparable: losing e-mail is not the same as millions of gallons of water from a reservoir or an electrical blackout !!!

Thank You& Have a Good Time…